(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
17 July 2003 (17.07.2003)

PCT

(10) International Publication Number
WO 03/058020 A1

(51) International Patent Classification[7]: E06B 9/80, 9/84, 9/54

(21) International Application Number: PCT/IT02/00403

(22) International Filing Date: 20 June 2002 (20.06.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
TO02A000038 14 January 2002 (14.01.2002) IT

(71) Applicant *(for all designated States except US)*: GIANUS S.P.A. [IT/IT]; Via Arona, 6, I-20149 Milano (IT).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: ZANGIROLAMI, Marco [IT/IT]; Via Per Castelletto, 65, I-28040 Borgoticino (IT).

(74) Agent: GARAVELLI, Paolo; A.Bre.Mar. S.r.l., Via Servais, 27, I-10146 Torino (IT).

(81) Designated States *(national)*: AE, AG, AL, AU, BA, BB, BG, BR, BZ, CA, CN, CO, CR, CU, CZ, DM, DZ, EE, GD, HR, HU, ID, IL, IN, IS, JP, KP, KR, LC, LK, LR, LS, LT, LV, MA, MG, MK, MN, MX, NZ, PL, RO, SG, SI, SK, TT, UA, US, VN, YU, ZA.

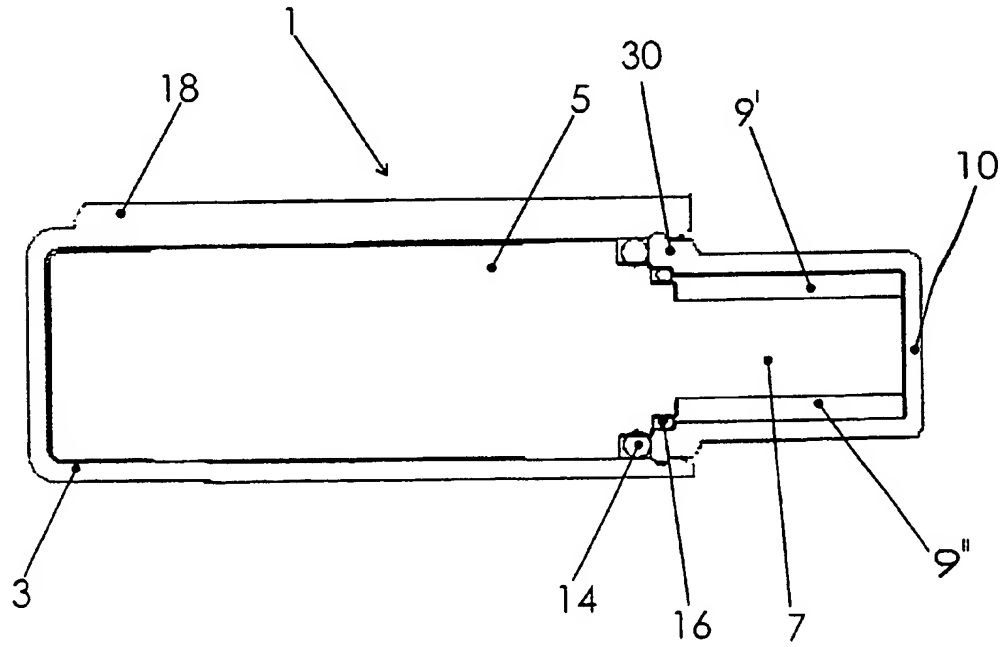
(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:
— *of inventorship (Rule 4.17(iv)) for US only*

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: VISCOUS BRAKING DEVICE EQUIPPED WITH MONODIRECTIONAL MECHANISM, PARTICULARLY FOR MOSQUITO CURTAINS



(57) Abstract: A viscous braking device (1) is disclosed equipped with monodirectional mechanism for rolling members, particularly for mosquito curtains, comprising: one stator (3) containing viscous fluid; one winged rotor (5) contained inside the stator (3); eccentric braking control means (7) connected to the rotor (5); and eccentric braking means (9) coupled with the eccentric control means (7) in order to allow a viscous braking of the rolling members along a first rotation direction of the rotor (5) and allow a free sliding of the rolling members along a second rotation direction of the rotor (5) opposed to the first rotation direction.

WO 03/058020 A1

VISCOUS BRAKING DEVICE EQUIPPED WITH MONODIRECTIONAL MECHANISM, PARTICULARLY FOR MOSQUITO CURTAINS

The present invention refers to a viscous braking device equipped with a monodirectional mechanism, adapted particularly to be used for braking rolling devices, such as rollers and the like, for example having wound thereon rolls of various materials to be used as coverage, repair or protection, such as mosquito curtains.

For an easy explanation, the invention will be described as applied to the field of mosquito curtains, but it will be immediately evident that the device of the invention can be applied to any object in which the problem of dampening the closure of a rolling device has to be solved, such as a darkening screen for a window or a wound cloth.

In their classical construction, such systems (not shown, because well known in the art) are made of an hollow roller, containing on one side a

winding spring, in which such roller is adapted to have wound thereon, in the smallest possible space, the screening fabric. Upon a complete extension of the cloth, the winding spring is very loaded, since its purpose is really taking back without efforts the cloth in its rest position when it is necessary to wind it again onto the roller. However, given the very high load on the spring, the roller re-winding brusquely and violently occurs, and this could result in dangers for the user such as hand squashing, scratches, or anyway a violent impact with a fastidious noise.

Object of the present invention is solving the above prior-art problems, by providing a device that is adapted on one side to allow the free sliding of the cloth when opening it, and on the other side to brake the cloth return when closing it due to the spring load.

A further object of the present invention is providing a device as mentioned above that can be realised with a very limited number of pieces, preferably in a plastic material, making the assembly operations easier and thereby reducing the related costs. For such purpose, the best technical solution should also be contained inside the

roller, in order to simplify at its maximum the installation and in order not to affect the aesthetic appearance of the global device. Moreover, such arrangement has a resisting force that is inversely proportional to the rotation speed, in order to perform an efficient braking when the spring is very loaded (complete cloth extension) and not to block its re-winding when the re-winding force is minimum (re-winding end).

The above and other objects and advantages of the invention, as will appear from the following description, are obtained by a viscous braking device as claimed in Claim 1. Preferred embodiments and non-trivial variations of the present invention are claimed in the dependent Claims.

The present invention will be better described by some preferred embodiments thereof, given as a non-limiting example, with reference to the enclosed drawings, in which:

- Figure 1 is a perspective view of an embodiment of the braking device according to the present invention;

- Figure 2 is a side sectional view of the device in Fig. 1;

- Figure 3 is a front sectional view of a part

of the device in Fig. 1;

- Figure 4 is a front sectional view of another part of the device in Fig. 1;

- Figure 5 is an exploded perspective and a final installation view of the device in Fig. 1;

- Figure 6 is an exploded perspective view of the device in Fig. 1;

- Figure 7 is a partial perspective view of the device in Fig. 1 that shows the jaws in their closing position;

- Figure 8 is a partial perspective view of the device in Fig. 1 that shows the jaws in their opening position; and

- Figure 9 is a schematic perspective view of a ratchet gear variation of the braking device of the present invention.

With reference to the Figures, a preferred embodiment of the viscous braking device of the invention is shown. As already seen, it will be immediately obvious that numerous variations and modifications (for example related to shape, sizes, various colours and parts with equivalent functionality) can be made to the described device without departing from the scope of the invention as appears from the enclosed Claims.

As shows in the Figures, the viscous braking device 1 of the invention is equipped with a monodirectional mechanism (in order to eliminate friction forces during its manual unwinding) and is employed for rolling members, in particular for mosquito curtains: such members could be composed, in a non-limiting way, of a roller 2 (Fig. 5) around which a cloth (not shown) is wound, such as for example the net-shaped cloth for a mosquito curtain.

In the following description, conventionally the term "stator" will designate the external housing, similarly to what happens in an electric motor, and the term "rotor" will designate the internal member. It is evident that this is simply a convention, because what matters is the relative motion between the two parts. For example, also for electric motors (such as the electric fans hanged to the ceiling), the rotary part is the external one, though remaining the 'stator' of the device.

The device 1 of the invention substantially comprises:

- at least one stator 3 containing viscous fluid;
- at least one winged rotor 5 contained inside

the stator 3;

- eccentric braking control means 7 connected to the winged rotor 5; and
- eccentric braking means 9 operatively coupled with the eccentric control means 7 in order to allow a viscous braking of the rolling members along a first rotation direction of the rotor 5 and allow a free sliding of the rolling members along a second rotation direction of the rotor 5 opposed to the first rotation direction.

In particular, the stator 3, that is the viscous fluid container, in the embodiment shown in Fig. 1 to 8, contains inside it all main components of the device 1, being equipped with an undercut that allows the related elastic assembling.

The rotor 5, instead, in the preferred embodiment shown, is the part that performs the real braking task, and is equipped with a plurality of wings whose double functions are increasing the viscous fluid turbulence and operating as storage room for the fluid.

In addition to the above-listed basic members, the device 1 of the invention further comprises at least one drum 10 adapted to be coupled with an

external system 11 for holding the device 1, as can be seen in Fig. 5. In this way, once having placed the device 1 inside a roller 2 and having operatively connected it to the external holding system 11, it is possible to realise the final operating configuration of the mosquito curtain, or other systems of this type, in a simple, immediate and efficient way. The drum 10 internally houses the eccentric braking control means 7 and the eccentric braking means 9; externally, it must have a sufficient mechanical resistance to be stiffly keyed onto an elastic joint integral with the fixed part of a supporting frame for the whole system. In one of its possible embodiments, the elastic joint is obtained by a helical spring section with winding direction opposite to the brake locking direction: in such a way, when it is stressed, it tends to tightly wind the drum itself, blocking it. The drum 10, in its rear part, houses a trapezoidal hooking profile 30 adapted to be inserted into the stator undercut and to allow snappingly closing the device 1.

In particular, in the non-limiting embodiment shown, the eccentric braking control means 7 are composed of a cylindrical member having two spiral-

shaped external surfaces 24, 26 that, when rotating along the first direction, enlarge the eccentric braking means 9 against the drum 10 (Fig. 8), while when rotating along the second direction, operating on braking ramp "heels", completely release the expansion action (Fig. 7) allowing the free rotation of the eccentric braking means 9 inside the drum 10. It is of major importance in this case that the expansion gradient of the device 1 is lower than the friction coefficient of the materials being used, since, otherwise, the braking means 9 would be dragged in a rotation without performing a correct braking action.

Further in particular, the eccentric braking means 9 are composed of at least two jaws 9', 9'' composed of two half-cylinders with variable wall thickness: such jaws 9', 9'' are adapted to fill the space between the eccentric braking control means 7 and the drum 10. As regards the jaws 9', 9'', the mechanical accuracy is of major importance, since the possible eccentricity for a correct operation is equal to few tenth of a millimeter: an excessive clearance would compromise the locking of the jaws 9', 9'', while an even small interference would prevent their correct free

rotation.

The device 1 of the invention further comprises holding means 12 of the viscous fluid, that are operatively inserted on one side between rotor 5 and stator 3 and on the other side between rotor 5 and drum 10 to prevent the viscous fluid from going out of the device 1. In particular, the holding means 12 can be composed of at least two gaskets (for example rings of the O-ring type or lip seals, labyrinth seals, etc.) 14, 16, one 14 placed at an interface between stator 3 and rotor 5 and another 16 placed at an interface between rotor 5 and drum 10. The second level of gasket 16 is used to prevent even the smallest leakage of oil from contacting the jaws 9', 9'' reducing their functionality. Such gasket 16 is however not fundamental for the invention: in fact, for example in case of a monodirectional device of the ratchet gear type, it is useless. Other types of holding means 12 are obviously possible provided that they are adapted to realise the same fluid holding functionality.

Moreover, the stator 3 is equipped with at least one clamping member 18 (for example one is shown of the key-type) adapted to engage the roller 2 (as

can be seen in Fig. 5) in order to operatively connect the roller 2 to the device 1. Object of the key in fact is preventing the relative rotation between roller 2 and device 1. For the same reason, also the drum 10, in particular applications, could be equipped with a key.

As regards the viscous fluid with which the device 1 of the invention operates, it can be (preferably, but not exclusively) high-viscosity oil, for example 100,000 cSt oil, or a grease, used in some viscous-dynamic brakes in order to make it easier for the sealing members to be executed. However, the preferable choice remains an oil, since, in order to be able to create a device with a force going to zero when the speed tends to zero, it is necessary to use a liquid and not a solid, though extremely yieldable.

As regards the physical and thermodynamic characteristics of the device 1 of the invention, it resists to a swinging torsion stress of at least 0.2 Nm and dissipates a power of 5 mechanical W during a typical re-winding of 0.3 m/s, with a braking force of 15 N. During the single manoeuvre for a braking distance of about 2 m, it is not very highly heated, as well as in case of repeated

actuations at its maximum speed.

As clearly appears from the description of a preferred application as provided above, the present invention provides for numerous application variations in the most different fields. The basic principle on which it is based, in fact, is, in a simple but major way, the presence of a kinematic chain of the fluido-dynamic braking system that is essentially composed of a moving part, adapted to transmit force torques with a rightward or leftward movement whether an opening or closing phase occurs, and a fluido-dynamic brake that is made by one or a plurality of viscous friction stages, each one composed of a stator and a rotor.

One of these preferred variations (not shown) provides that the device 1 of the invention is further equipped with a speed multiplier (for example of the epicyclic type) placed at the rotor 5 inlet and adapted to increase the rotor 5 speed to obtain a greater braking torque or a lower oil viscosity degree (useful to accelerate the manufacturing process of the device 1). An arrangement of this type further helps the effect of the braking torque increase with the rotation speed increase, since the rotor speed is greater

than the stator speed by an amount that is equal to the reduction ratio. In the particular case of an epicyclic reduction gear, moreover, a reversal of the rotor rotation direction is realised, so that the relative rotor-stator speed will be equal to:

$$\Delta\omega = \omega r + \omega s * R$$

where $\Delta\omega$ is the angular rotor-stator speed, ωr is the angular rotor speed and ωs is the angular stator speed.

It is thereby deduced that this arrangement is particularly interesting if high braking moments have to be obtained in a small space.

Even if the previous description has been based on a braking device 1 of the fluido-dynamic type, an important feature of the present invention is using any type of brake having a braking torque that is intrinsically depending on the speed ω inverse, in order to avoid that it is necessary to manually intervene in order to complete the screen opening. In fact, in addition to the above-described device, it is possible to devise an equivalent device (not shown) that is based on an eddy currents brake. In its simplest arrangement, it is made of one stator made of conducting material, or respectively a magnetic material, and

a rotor made of a magnetic material (possibly electromagnetic in order to be externally activated), or respectively a conducting material. According to this variation, by relatively moving the two parts, it is obtained that the flow variation of the magnetic lines cutting the conducting material induces therein some eddy currents (Foucault currents) that in turn create a magnetic field with such a direction as to oppose the causes that generated it (Lenz law), or the movement itself, thereby performing the desired braking action. Though having an higher cost, this arrangement allows obtaining devices that can operate at the lowest temperatures, which is not always possible with oils. Moreover, the chance, in case of use of an electromagnet, of activating the brake from the outside allows avoiding to insert the monodirectional device in order to reduce the closing braking capability.

Further variations of the invention are moreover possible, that can be applied, for example, to the monodirectional (or free wheel) device, all these variations being adapted to disconnect the braking torque when the curtain rotation direction is reversed, in order to avoid having a braking force

during the closing step.

As (non-limiting) variations of the free wheel to be used, all able to be made of plastic materials (since, with mosquito curtains and the like, small braking torques are present), two types can be mentioned as an example. The first one is a ratchet gear type (as shown in Fig. 9), in which the stator 3' is contained inside the rotor 5' and is equipped with at least one elastic catching tongue 20 adapted to cooperate with corresponding saw teeth 22 with which the internal circumference of the rotor 5' is equipped in order to realise a braking action along a direction and a sliding action along an opposite direction. With this embodiment, it is avoided to use lubricants with their related sealing problems.

Another variation, that is less operatively noisy than the previous one, is the type with helical spring brake (not shown): in this case, the fact is exploited that an helical spring wound around a pin (or forced into an hole), when it is forced to rotate along the same winding direction by an external torque, looses its grip and lets the pin slide, while when it is forced along the opposite direction, is more and more strictly

tightened, blocking the pint itself. In this case, the free wheel direction can be easily reversed, replacing a rightward spring with a leftward spring and vice versa. The spring can also function as articulated joint between brake and fixed part.

The above-shown embodiments therefore show a braking device that is wholly made of plastic material through injection moulding (acetalic homopolymer): this allows obtaining high manufacturing savings on large volumes. Moreover, not being equipped with metallic parts, it allows the parts subjected to wear to have a higher working repeatability and roughness reduction, all to the advantage of reliability. The presence of a monodirectional member then allows, in the particular application for mosquito curtains and the like, to strongly improve the necessary effort to actuate the screen on which it will have to be applied.

CLAIMS

1. Viscous braking device (1) equipped with a monodirectional mechanism for rolling members, particularly for mosquito curtains, characterised in that it comprises:
   - at least one stator (3) containing viscous fluid;
   - at least one winged rotor (5) contained inside said stator (3);
   - eccentric braking control means (7) connected to said winged rotor (5); and
   - eccentric braking means (9) operatively coupled with said eccentric control means (7) in order to allow a viscous braking of the rolling members along a first rotation direction of said rotor (5) and to allow a free sliding of the rolling members along a second rotation direction of said rotor (5) opposed to said first rotation direction.
2. Device (1) according to Claim 1, characterised in that it further comprises at least one drum (10) adapted to be coupled with an external system (11) for holding said device (1).
3. Device (1) according to Claim 2, characterised

in that it further comprises holding means (12) of said viscous fluid, said holding means (12) being operatively inserted on one side between said rotor (5) and said stator (3) and on another side between said rotor (5) and said drum (10) to prevent said viscous fluid from going out of said device (1).

4. Device (1) according to Claim 3, characterised in that said holding means (12) are composed of at least one gasket (for example a ring of the O-ring type or a lip seal) (14), said gasket (14) being placed at an interface between stator (3) and rotor (5).

5. Device (1) according to Claim 3, characterised in that said holding means (12) are composed of two gaskets (for example rings of the O-ring type or lip seals) (14, 16), one (14) placed at an interface between stator (3) and rotor (5) and another (16) placed at an interface between rotor (5) and drum (10).

6. Device (1) according to Claim 1, characterised in that said stator (3) and/or rotor (5) is(are) equipped with at least one clamping member (18) adapted to engage said roller (2) in order to operatively connect said roller (2) to said

device (1).

7. Device (1) according to Claim 2, characterised in that said eccentric braking control means (7) are composed of a cylindrical member having two spiral-shaped external surfaces (24, 26) that, when rotating along said first direction, enlarge said eccentric braking means (9) against said drum (10), while when rotating along said second direction release the engagement with said eccentric braking means (9) against said drum (10).

8. Device (1) according to Claim 2, characterised in that said eccentric braking means (9) are composed of at least two jaws (9', 9'') composed of two half-cylinders with variable wall thickness, said jaws (9', 9'') being adapted to fill the space between said eccentric braking control means (7) and said drum (10).

9. Device (1) according to Claim 1, characterised in that said viscous fluid is high-viscosity oil.

10. Device (1) according to Claim 1, characterised in that said viscous fluid is grease.

11. Device (1) according to Claim 1, characterised in that it is further equipped with a speed

multiplier placed at an inlet of said rotor (5), said speed multiplier being adapted to increase the speed of said rotor (5) in order to obtain a greater braking torque or a lower degree of viscosity.

12. Device (1) according to Claim 11, characterised in that said speed multiplier is of the epicyclic type.

13. Device (1) according to Claim 1, characterised in that said device (1) is of a type with eddy currents brake, said device (1) including a stator made of conducting material and a rotor made of magnetic material.

14. Device (1) according to Claim 1, characterised in that said device (1) is of a type with eddy currents brake, said device (1) comprising a stator made of magnetic material and a rotor made of conducting material.

15. Device (1) according to Claim 1, characterised in that said device (1) is of a type with a ratchet gear brake, said stator (3') being contained inside said rotor (5'), said stator (3') being equipped with at least one elastic catching tongue (20) adapted to cooperate with corresponding teeth (22) with which an internal

circumference of said rotor (5') is equipped in order to realise a braking action along a direction and a sliding action along an opposite direction.

16. Device (1) according to Claim 1, characterised in that it is of a type with helical spring brake, said device (1) being equipped with at least one helical spring wound around a pin that, when it is forced to rotate along a same winding direction by an external torque, loosens its grip and let said pin slide, while when it is forced along an opposite direction, is more and more strictly tightened thereby locking said pin.

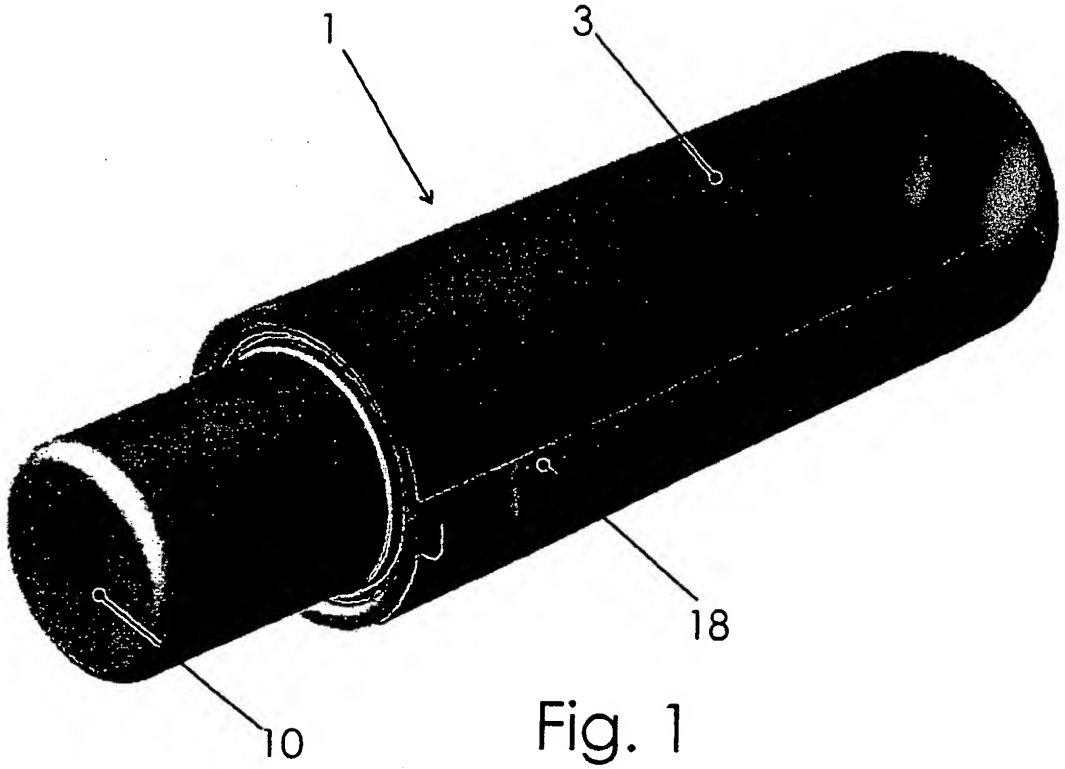


Fig. 1

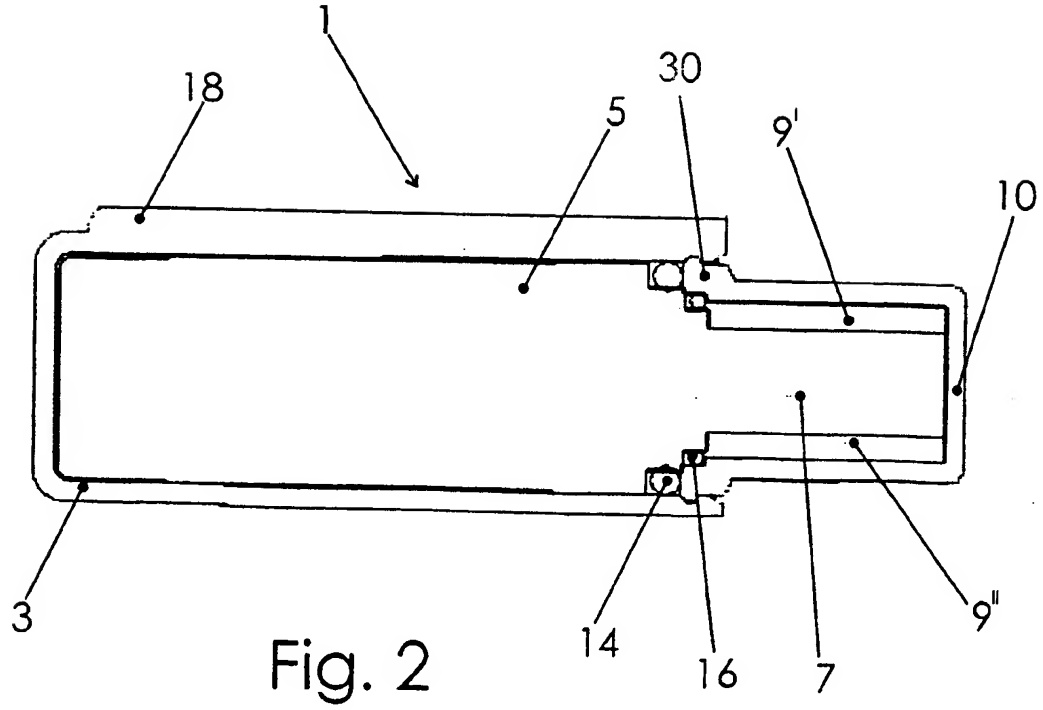


Fig. 2

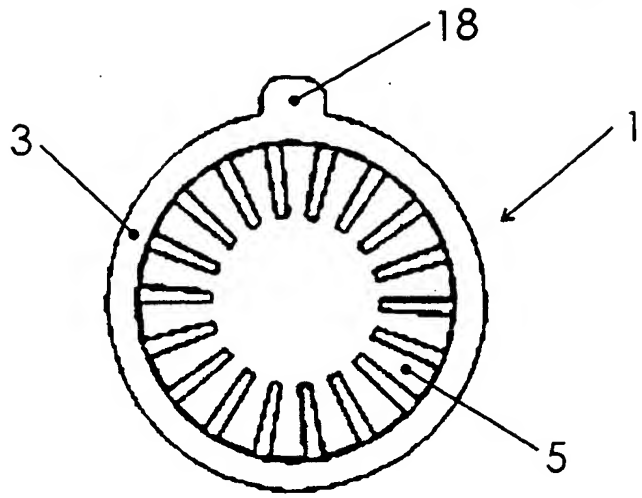


Fig. 3

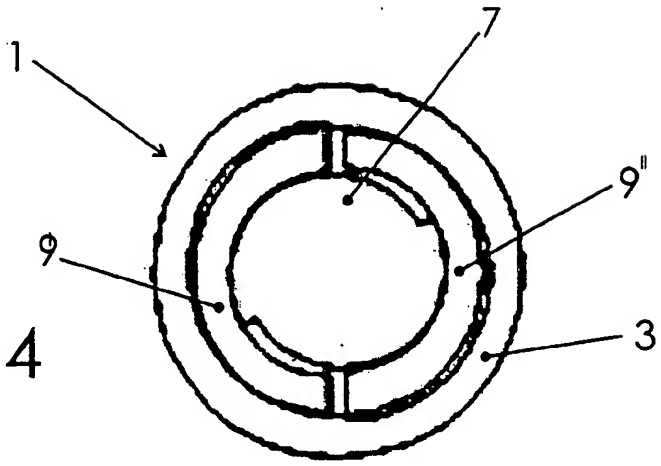


Fig. 4

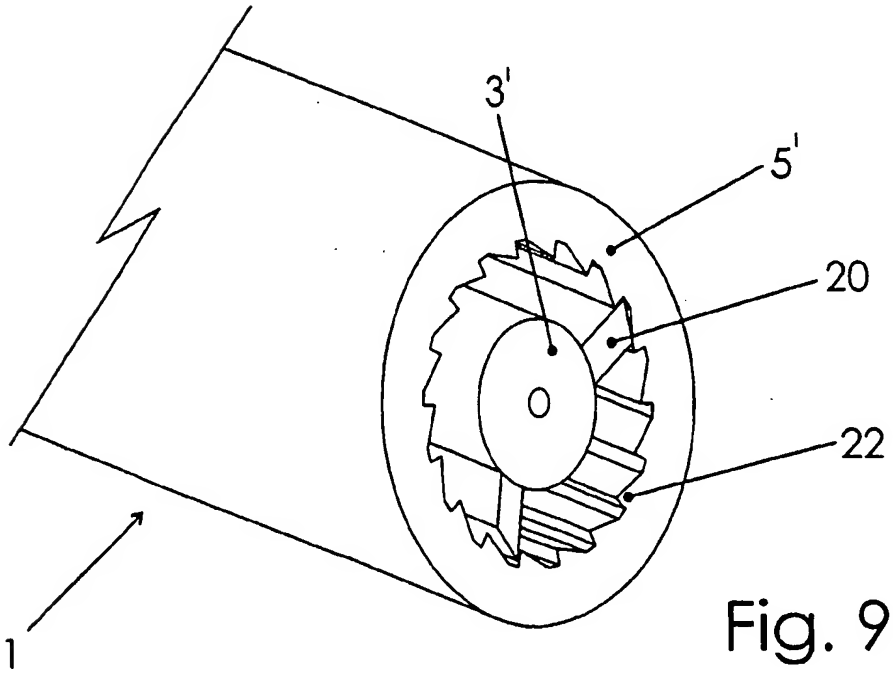


Fig. 9

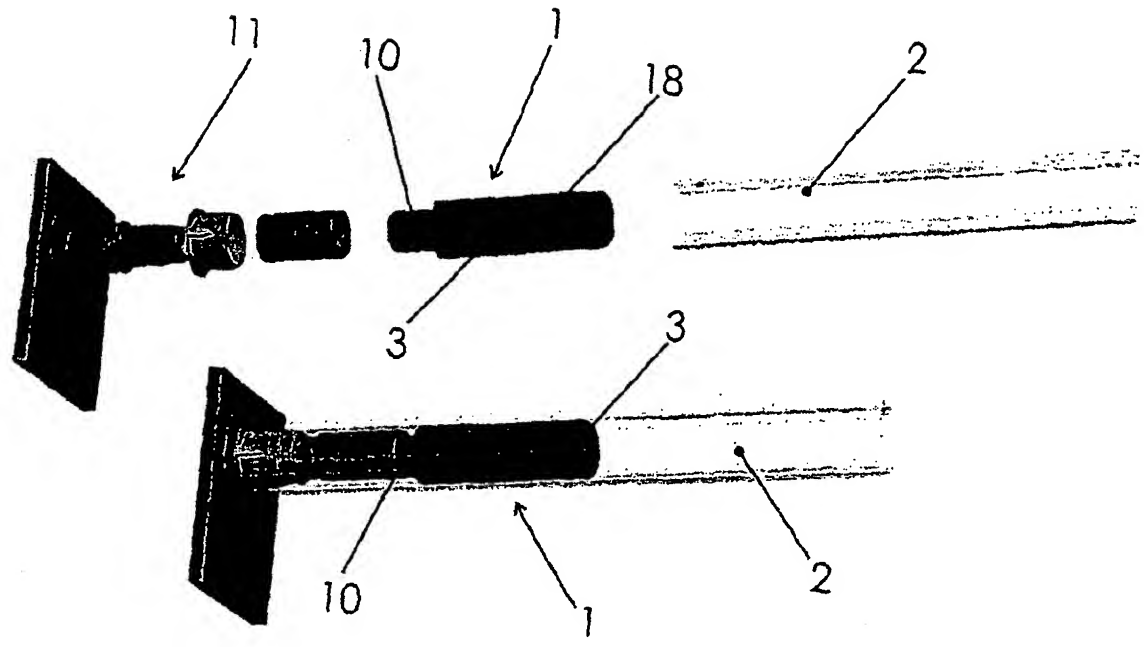


Fig. 5

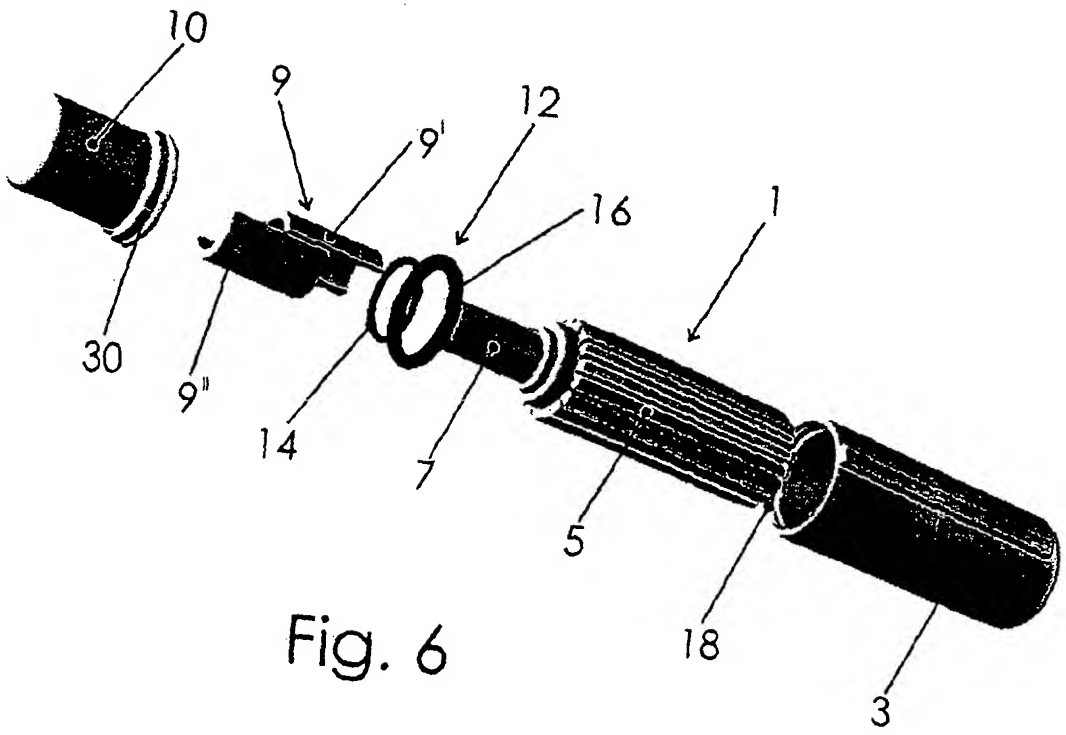


Fig. 6

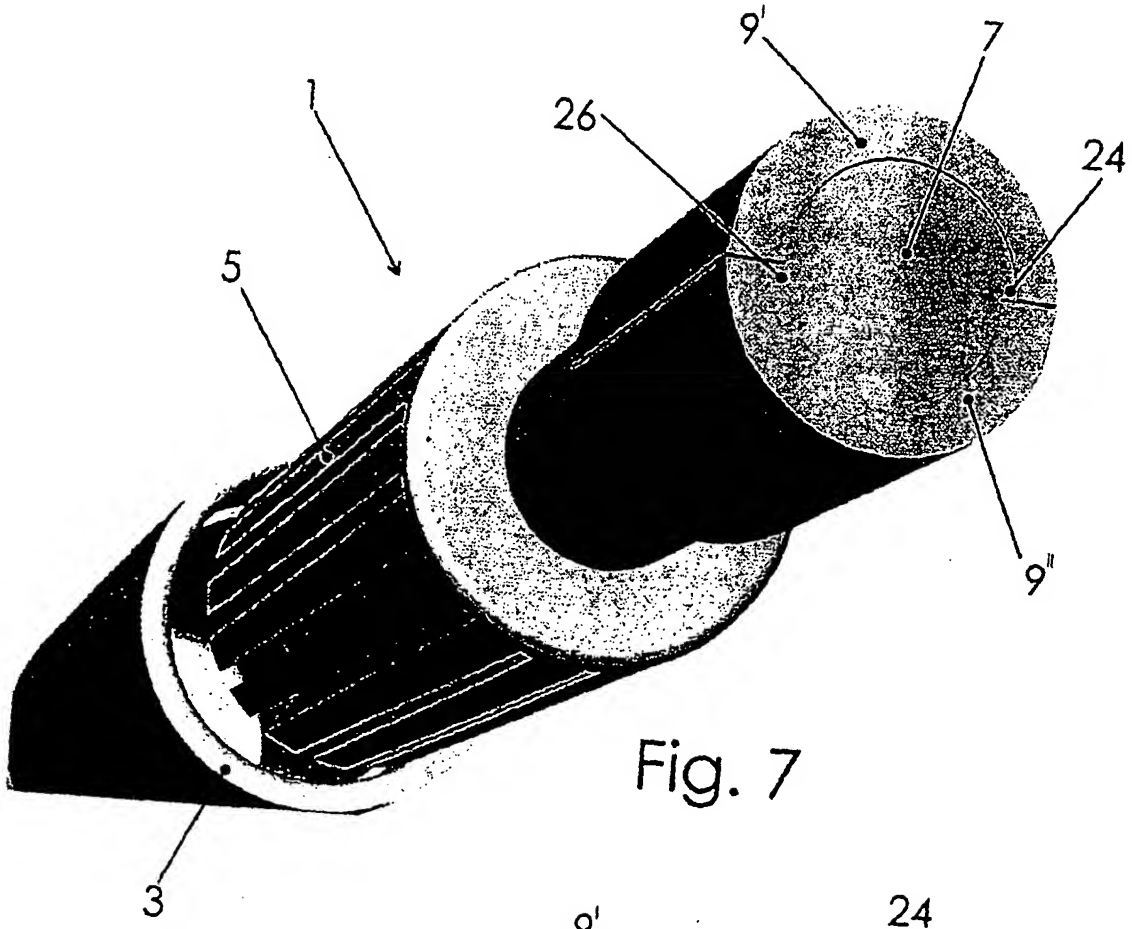


Fig. 7

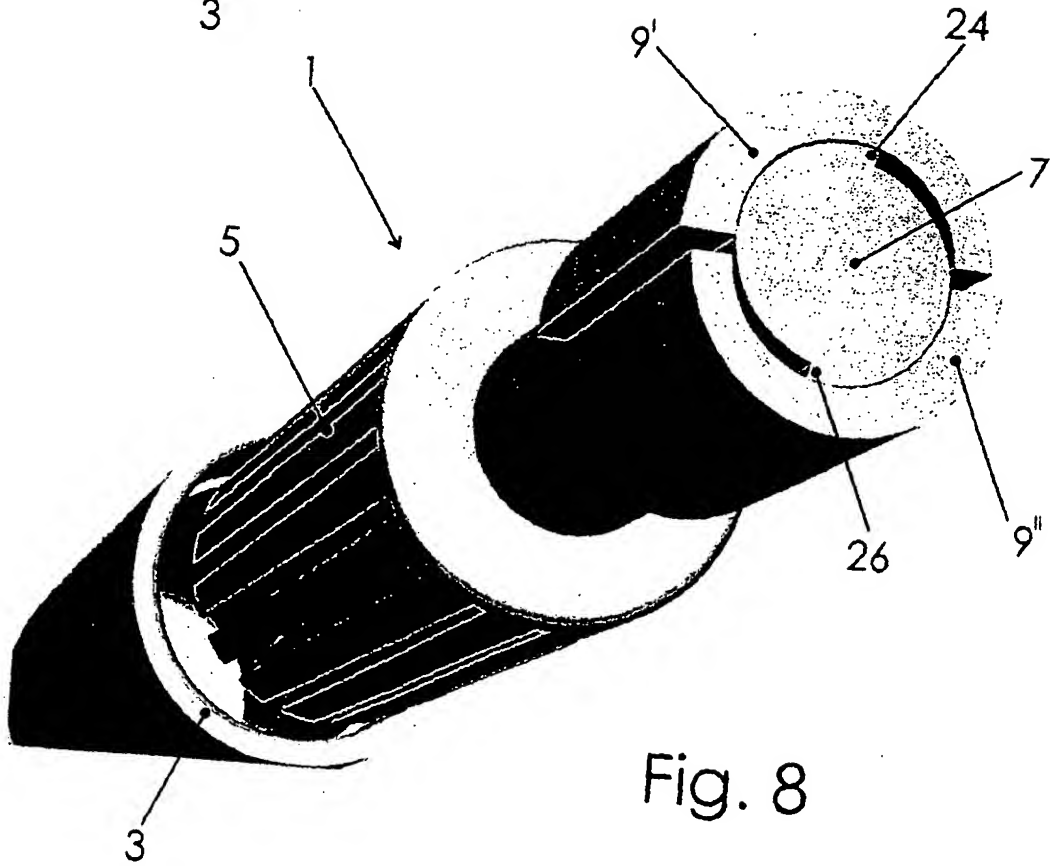


Fig. 8

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IT 02/00403

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 E06B9/80 E06B9/84 E06B9/54

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 E06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 535 829 A (FUKUCHI SHIGEKI) 20 August 1985 (1985-08-20) the whole document ---	1
X	DE 43 20 393 A (WEBASTO KAROSSERIESYSTEME) 22 December 1994 (1994-12-22) the whole document ---	1
X	US 6 059 008 A (KURIBAYASHI TAKANOBU ET AL) 9 May 2000 (2000-05-09) the whole document ---	1
A	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 10, 17 November 2000 (2000-11-17) & JP 2000 185898 A (VISCODRIVE JAPAN KK), 4 July 2000 (2000-07-04) abstract -----	1-12

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
9 October 2002	09.01.03

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Merz, W

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IT 02/00403

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-12

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-12

   Viscous braking device

2. Claims: 13, 14

   Braking device with eddy currents brake

3. Claim : 15

   Braking device with ratchet gear brake

4. Claim : 16

   Braking device with helical spring brake

Information on patent family members

International Application No
PCT/IT 02/00403

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4535829 A	20-08-1985	JP 1471500 C	14-12-1988
		JP 59118982 A	09-07-1984
		JP 63008270 B	22-02-1988
		DE 3346550 A1	28-06-1984
DE 4320393 A	22-12-1994	DE 4320393 A1	22-12-1994
US 6059008 A	09-05-2000	NONE	
JP 2000185898 A	04-07-2000	NONE	